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Committee on the Peaceful Uses of Outer Space

Implementation of an integrated, space-based global natural disaster management system

Note by the Secretariat

Addendum

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I. Introduction

1. At its forty-third session, the Committee on the Peaceful Uses of Outer Space agreed that, in accordance with the first year of the three-year work plan entitled "Implementation of an integrated, space-based global natural disaster management system", the Scientific and Technical Subcommittee at its thirty-eighth session should review the types of natural disasters being faced and the extent of the application of space-based services being utilized for their mitigation.[1]

2. The Committee also took note of the agreement of the Working Group of the Whole of the Scientific and Technical Subcommittee that the Secretariat should invite Member States and international organizations to submit to the Subcommittee at its thirty-eighth session information on the subject to be discussed at that session (A/AC.105/736, annex II, para. 41). The information submitted by Member States and international organizations up to and including 24 November 2000 is contained in document A/AC.105/753. The present document contains information submitted by Member States between 25 November 2000 and 16 January 2001.

II. Replies received from Member States

Germany

[Original: English]

1. The German Aerospace Center (DLR), in its capacity as Germany's space agency, is an active member of the German Committee for Disaster Reduction (DKKV). During the International Decade for Natural Disaster Reduction, which ended in 1999, the German national committee, chaired by former minister Norbert Blüm, was one of the most active Decade committees in the world and in 1998 hosted a large United Nations conference on early warning systems, with a meeting about space technologies convened by the late Lou Walter of the National Aeronautics and Space Administration of the United States of America and Wolfgang Steinborn of DLR. The decision to pursue the work after the Decade reflected not only the continued international recognition of the increased importance of combating hazards, but also the national necessity of having within Germany a coordination group for all relevant governmental and non-governmental organizations at the federal level, while most responsibilities with regard to disaster management are with the *Bundesländer* (federal states).

2. The name of the committee has been changed to DKKV and the statutes have been revised, giving even more priority to aspects of prevention and risk or vulnerability mapping, which coincides well with the potential of space technologies and has the full support of DLR. New publications of the Committee reflect this potential. For instance, the revised Journalist's Handbook, which, because of the comprehensive information it provides about all relevant German activities and actors, is receiving much international attention, contains a table on the potential of space-based communication, navigation and remote sensing for all phases of a disaster: prevention, early warning, and crisis management during and

after a disaster. A new brochure has on its back cover an example of how Earth observation data, received at German or European sites and processed in cooperation with local laboratories, served as useful information tools for the rescue teams in Turkey after the big earthquake that occurred in that country in 1999.

3. DLR has also initiated, within the framework of the new action programme of DKKV, an annual conference platform called Forum, where users and providers of relevant technology meet to exchange their views and experiences. The first such forum was held in September 2000 in Freiburg on the premises of the Global Fire Monitoring Center (sponsored by the German Foreign Office) with some 100 international participants. Many presentations highlighted the application of space techniques and Earth observation data in particular, including: the application of synthetic aperture radar (SAR) interferometry using data from European remote sensing satellites (ERS) or the Shuttle Radar Topography Mission to understand tectonic motion in Turkey and elsewhere, improving the prospects of being better prepared; and the use of satellite images to distinguish hazardous from beneficial forest fires and help efforts to extinguish them, to model and predict floods and produce evidence for regulation and recovery after the event, and to map forest damage after the storm Lothar, which had recently hit France and Germany, providing decision makers with baseline data for timber transport logistics and forest restitution.

4. Some of the presentations were the result of projects supported by DLR in order to open up opportunities for the utilization of existing and future satellites. In view of the growing market potential, German space companies, partly merged into international commercial players and providers of geo-information (such as InfoTerra, an offspring of the European Astrium space company) or cooperating globally (such as Rapid Eye), are preparing new high-resolution optical and radar missions. The impact of the work of DKKV is also noticeable in the increased research and development spending on corresponding data networks such as the Deutsches Forschungsnetz Naturkatastrophen (DFNK), based at GeoForschungsZentrum Potsdam, or research centres such as the Zentrum für Naturrisiken und Entwicklung Bonn (ZENEB). Both institutions form part of international networks and employ space techniques to a large extent. As a case study, the DLR institute for remote sensing methods has worked out, together with the Joint Research Centre of the European Union and applications organizations, an Earth-observation-based Geographic Information System to support reconstruction efforts in Kosovo. Recently, the Federal Ministry of the Interior, as part of its efforts to coordinate government efforts and provide governmental and non-governmental organizations with access to centralized information sources, has announced plans to set up an operational information network "for large area hazardous situations", thereby connecting with DLR.

Pakistan

[Original: English]

1. Pakistan has been experiencing many types of major disasters such as floods, waterlogging and salinity, desertification and cyclones. The national space agency of Pakistan, the Space and Upper Atmosphere Research Commission (SUPARCO), has been extensively and intensively using space-related technology for regular monitoring and forecasting of disasters. A summary of those activities is given below.

1. Floods

2. Floods occur as a result of widespread and intense rainfall and melting of snow in catchment areas, injuring or killing people and damaging property and vast areas of cultivated land. The mapping and monitoring of floods are therefore important to the population living and working in flood-prone areas. Accurate, rapid and economical methods are needed to provide the data necessary for planning and management functions in order to avert such disasters. Before the advent of satellite remote sensing (SRS), conventional methods were used for surveying flood inundation areas, which was a difficult and tiresome task. Remote sensing technology has overcome those difficulties and has proved useful in studying floods in detail. In Pakistan, SRS was introduced in 1973. Since then, SUPARCO, using SRS data, has conducted various studies relating to flood inundation mapping during floods in Pakistan. In addition, forecasting of the occurrence of floods has been carried out and passed on to the relevant agencies (National Flood Commission etc.) so that protective and remedial measures could be taken in the areas prone to flooding, thereby reducing flood damage to a minimum.

3. SRS data has also proved to be an effective and reliable tool for irrigation engineers and hydrologists engaged in flood hazard mapping and monitoring at the national level, for operational planning of irrigation systems in general and river embankments in particular.

4. Using SRS and Geographic Information System (GIS) technologies, indigenous methodology has been developed for use by SUPARCO and the relevant agencies for flood management purposes.

2. Waterlogging and salinity

5. Soil salinity has been a menace to irrigated agricultural lands throughout the world. Large areas of agricultural land in Pakistan are faced with the problem of waterlogging and salinity. SUPARCO has been studying the problem since 1973. Changes that occurred in the selected areas affected by salinity and waterlogging problems were studied using SRS data and GIS techniques. Ground surveying of those selected sites has been conducted, and that has helped in the preparation of thematic maps demarcating clearly the status of land use and land cover, as well as the density of salinity, the extent of waterlogged areas etc. That has greatly helped the relevant government agencies by increasing their awareness of the extent of the

problem, enabling them to take the necessary measures to control and check its spread to other areas.

3. Desertification

6. The Cholistan and Thar are two vast deserts in Pakistan covering an area of about 100,000 km2. Degradation of soil and vegetation cover in those deserts is caused by wind erosion, overgrazing and excessive salt accumulation. Depletion of vegetation resources through woodcutting and overgrazing of ranges has adversely affected the natural vegetation growth process. Climate has also had a negative effect on that process. The entire area is marked by only sporadic and erratic rainfall and a high rate of evaporation, which cause vegetation degradation. In order to put a stop to the situation, efforts are being made by the relevant national agencies to reclaim certain areas. Multi-temporal, multispectral and multi-spatial SRS data are being employed for analysis and interpretation in order to prepare classification maps highlighting major land-use classes: plantations, cultivated land, fallow fields and dry sand. A comparison of those maps with maps prepared using remote sensing data obtained in the past revealed that plantation areas were slowly increasing, thereby proving that the land reclamation process undertaken by the relevant national agencies was yielding positive results.

7. Another element in this category is riverine forests. Monitoring and management of the forests therefore have a significant impact on the ecological and climatic balance, which in turn affects socio-economic development. In Pakistan, both natural and human factors have been the cause of the deterioration of the physical environment and natural resource base. The construction of dams and barrages on the upper reaches of the great river Indus for hydroelectric power generation and irrigation has significantly reduced the discharge of freshwater into the lower Indus basin. As a result, thousands of acres of riverine forests in the lower reaches have disappeared. The heavy floods in 1978 and 1990 altered the course of the river Indus in many places and damaged the riverine forests. An integrated approach, involving SRS data, was attempted in those years to evaluate the geographic extent and distribution of the riverine forests in the lower Indus basin. The data were analysed to yield classification maps for various categories of land use, such as forests, sandy and clayey soils and river channels. The results were combined with the available database to obtain a reference spatial surface for detecting changes in forest cover. The resulting maps were shared with the relevant agencies to facilitate remedial measures for monitoring and checking the deforestation process.

4. Cyclones

8. SUPARCO is using National Oceanic and Atmospheric Administration (NOAA) and METEOSAT-5 satellite images in the visible and infrared channels received by and processed at its data receiving station to regularly monitor cloud types and their movement, build-up of cyclones, storms, fronts and fog and other weather conditions, in order to estimate temperature and other meteorological parameters on cloud tops and sea and land surfaces for various studies. Over the past several years, SUPARCO, using NOAA data, has also monitored severe cyclones developing in the Bay of Bengal and hitting the coastal areas of

Bangladesh, India and Pakistan. The monitoring and prediction of cyclone movements and cyclonic intensity have enabled SUPARCO to issue warnings to the relevant agencies, enabling them to take the necessary precautionary measures before cyclones have hit coastal areas.

Notes

[1] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* (A/55/20), para. 119.

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Committee on the Peaceful
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Implementation of an integrated, space-based global natural disaster management system

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* The present document contains information received from Member States between 17 January and 19 April 2001.

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I. Introduction

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II. Replies received from Member States

Canada

1. On 20 October 2000, the Canadian Space Agency (CSA) joined the European Space Agency (ESA) and the Centre nationale d'études spatiales (CNES) of France in signing the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters (the "International Charter on Space and Major Disasters"), further expanding Canada's ability to provide timely information to countries in distress. Mac Evans, President of CSA, described the Charter as a far-reaching humanitarian initiative that would lead to the coordination and global positioning of space resources, such as Canada's renowned Synthetic Aperture Radar Satellite (RADARSAT)-1, providing timely and critical imaging to agencies directing rescue and relief efforts in times of natural and technological disasters.

2. As at 1 November 2000, countries mobilizing rescue and relief efforts to deal with natural or technological disasters can dial a dedicated telephone number to access quickly the space resources of CSA, CNES and ESA. Those space resources include the coordinated use of Earth observation satellites like RADARSAT, the Satellite pour l'observation de la Terre (SPOT), the European Remote Sensing satellite (ERS) and soon the Environmental Satellite (Envisat) and ground facilities to produce data imaging. Other satellites supporting telecommunications, telemedicine and navigation provide additional support and may help, for example, in the positioning of floating booms in the case of an oil spill. The three space agencies will name a project manager who will maintain constant contact throughout the crisis with the requesting country, relief agency or organization while

[1] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* (A/55/20), para. 119.

coordinating the effective deployment of those space resources. The available assistance offered to requesting agencies will also include the treatment and interpretation of the satellite imaging. When launched, the Artemis and Stentor telecommunications satellites will add to the space resources, enhancing the relay of satellite data to agencies and organizations on the ground.

3. Assistance was provided in a first joint operation following a major landslide in Slovenia on 17 November 2000. Signatories of the International Charter again dispatched their Earth observation satellites to capture images of the devastation caused by the January 2001 earthquake in El Salvador. The combination of the Charter signatories' resources is providing emergency rescue organizations with imaging that is captured day and night and in all weather conditions.

4. RADARSAT-1's frequent revisit period and beam flexibility allow users to monitor an area reliably under emergency conditions. Services associated with the RADARSAT programme, such as emergency programming, near-real-time data processing and electronic delivery, allow response agencies to receive data and assess emergency areas quickly during periods of crisis.

5. Canada actively contributed to rescue and relief efforts prior to joining the International Charter. During the Mozambique flooding of spring 2000, Canada's Earth observation satellite took images demonstrating the extent of flooding. CSA, together with RADARSAT International, Inc., the Canada Centre for Remote Sensing and the Department of National Defence, made available the data gathered by RADARSAT-1 to the Mozambican authorities to facilitate the management of humanitarian aid efforts and the evacuation of flood victims. A satellite image acquired on 1 March 2001 by RADARSAT-1 clearly showed the flooding along the Limpopo River to Xia Xia in southern Mozambique. The image was acquired using RADARSAT's Standard 7 beam, which nominally covers an area of 100 km by 100 km with a resolution of 25 metres.

6. RADARSAT-2, Canada's next-generation Earth observation satellite, currently under construction by MacDonald Dettwiler and Associates and scheduled for launch in early 2003, will further increase Canada's ability to provide precise imaging to meet the evolving needs of clients while fulfilling its Charter commitment to relief agencies and disaster management organizations.

7. Canada will also continue to support the efforts of the Disaster Management Support Group—operating under the umbrella of the Committee on Earth Observation Satellites—which has worked extensively to support improved utilization and coordination of Earth observation satellite data over the years.